

spring, which bears against the projecting point of the spindle and so controls any lateral movement.

In addition to the recording cylinder a second clock will be noticed in the illustration. This was introduced because it was found that the pen was inclined to stick to the paper, so that the full range of temperature was not recorded. The clock once in every minute draws the pen away from the paper, so that it is free to take up its natural position. Hence the trace is made up of a series of dots instead of being a continuous line. The minute hand of the clock is replaced by a wheel in which sixty teeth are cut. Every minute one of the teeth engages with a short pin supported by a flat steel spring. When this pin is pushed aside it draws after it one of the springs referred to above as pressing against the point of the spindle. The spring at the opposite end of the spindle consequently comes into play and pushes the spindle in the direction of its length, thus relieving the pen from the paper.

In this thermometer the motion of the pen for a change in temperature of one degree Fahrenheit is about one inch (4.5 cm. per degree C.) at ordinary temperatures.

The thermometer selected for description is adapted for securing a continuous record of temperature. When it is desired to use such a thermometer to regulate the temperature, the pen may be replaced by a platinum point which is arranged to complete an electric circuit by contact with a platinum terminal or by dipping into a mercury cup. The current so set up may be used to operate a relay, and so switch on a stronger current, if heating by electricity is employed, or it may actuate some suitable mechanical arrangement for regulating the supply of gas to a stove. When it is necessary to maintain a uniform temperature for days or weeks together, it is most important that the sparking which takes place at the contact should be as far as possible reduced, otherwise the surfaces may become so contaminated that contact is uncertain, or in the case of platinum contacts may fuse together so that the contact is never broken. These are difficulties which those who have worked with such arrangements will appreciate. To overcome them it is well to reduce the current through the contact to the smallest possible value, and to place in parallel with the electromagnet which will form part of the circuit a non-inductive resistance. This resistance may be kept comparatively small, even at the expense of a somewhat larger current. A condenser inserted between the points of contact may be of service, but is not so effective as the plan mentioned.

It may be of interest to give some account of the success which has attended the use of these methods of regulating temperature in connection with the Blythswood dividing engine. The engine is placed in a detached building in a room fifteen feet long, ten feet wide, and ten feet high. Local conditions render it impossible to make use of a cellar. The room has double windows and shutters; it is warmed by two gas stoves, of which one is controlled by the regulating thermometer. During the greater part of the year this room can be kept at a temperature of 60° F., the variation in temperature being not more than one degree.

The controlling thermometer in this instance actuates, by an electromagnetic release, clockwork which supplies the necessary power for turning the gas on or off.

The dividing engine is enclosed in a wooden case inside this room. Originally the interior of the case was heated by electricity under the control of a regulating thermometer. The variations in temperature that were introduced by this method were sufficient to produce disastrous results in cutting a diffraction grating. Accordingly the case was surrounded with a lining of six inches of wool, and all the arrangements for securing a uniform temperature were made in the room outside. When this was done it was found that the temperature inside the case fell slowly but continuously. This was shown to be due to leakage of heat through the stand of the machine, which rested on a large stone block. To prevent this a space was cleared round the bottom of the stand, and this space was kept at a uniform temperature by electrical heating. This precaution was found to be effective, and the temperature of the case can now be kept constant with very considerable accuracy, the variation in four or five days not amounting to more than two-tenths of a degree Fahrenheit.

H. S. ALLEN.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The Public Orator, Dr. Sandys, spoke as follows on May 14, in presenting Mr. Robert Bell, LL.D., F.R.S., Director of the Geological Survey in Canada, for the degree of Doctor in Science *honoris causa*:

Magnū profecto est provinciae maximae penitus explorandae et scientiarum terminus latius proferendis vitam suam totam dedicasse. Salutamus virum, qui per annos plus quam quadraginta provinciae maximae Canadensis flumina, lacus, montes, campos denique latissime patentes exploravit; ibi locis plurimis nomina primus imposuit, et, ipse mortalium modestissimus, flumini a se primum indagato suum nomen ab aliis inditum audivit. Atqui nomen suum non in aqua scriptum, sed provinciae tantae in saxis potius insculptum reliquit; regionis illius immensae geologiam, geographiam, biologiam, archaeologiam libellorum in serie longa illustravit, et non modo provinciae ipsius terminos ubique definivit, sed etiam scientiarum fines ubique propagavit.

Duco ad vos Reginae Universitatis Canadensis doctorem, Societatis Regiae Londinensis socium, provinciae Canadensis exploratorem indefessum, ROBERTUM BELL.

A university lectureship in mathematics, stipend 50*l.* a year, is vacant by the election of Prof. Larmor to the Lucasian chair. Candidates are to send their names to the Vice-Chancellor by June 3, with statements of the branches of mathematics on which they are prepared to lecture.

In a report on the administration of the engineering laboratory it is proposed that two readerships, one in mechanical engineering and one in electrical engineering, should be established for Mr. Peace and Mr. Lamb, the present demonstrators; that two new university demonstrators should also be appointed, and that, in addition to their stipends, each of these should receive certain payments from the fees of students receiving instruction in the department. The growth of the latter under Prof. Ewing's direction may be gathered from the fact that in 1892 the number of students was 39, and the fees 546*l.*, while in 1902 there were 211 students, who paid 5005*l.* in fees. In the present year there are twelve teachers, in addition to the professor and the two demonstrators, engaged in the work.

The syndicate report that the new building for the medical school is almost completed, and that the last stone of the Humphry Museum has been laid. A sum of 8062*l.* is required for fittings, furniture, electric lighting, and heating appliances.

The discussion in the Senate on the proposed reestablishment of the professorship of surgery turned chiefly on the question whether or not full residence should be required of the professor. If non-residence were permitted, a smaller stipend might suffice, and the field of choice might be widened. Prof. Liveing, Prof. Woodhead and others urged strongly that the professor's usefulness would depend on his being resident in the University.

MR. EDWIN EDSER has been appointed head of the physical department of the Goldsmiths' Institute, New Cross.

A CONVERSAZIONE of the Parents' National Educational Union will be held at the Kensington Town Hall on Monday, June 8. The Countess of Aberdeen will preside, and a paper will be contributed by Miss Mason, founder of the Union.

THE Court of Governors of University College, Sheffield, has adopted resolutions to the effect that in the interests of higher education in the city and district it is essential that Sheffield College shall have the powers and *status* of a university similar to those granted to Birmingham, Liverpool, and Manchester, and also that application be made to the Privy Council for a charter.

THE Secretary of State for India has appointed a small committee to inquire and report to him on the question of the expediency of maintaining the Engineering College at Coopers Hill, as a Government institution for the supply of officers to the Public Works Department in India. The committee will be composed as follows:—Sir Charles Crosswaite, Sir James Mackay, G.C.M.G., Sir William Arrol,

M.P., Sir Arthur Rücker, and Sir Thomas Higham, K.C.I.E., with Mr. J. E. Ferard, of the India Office, as secretary.

THE new science rooms of the Colston's Girls' School, Bristol, were opened on Friday last, May 15, by the Right Hon. Henry Hobhouse, M.P. The new building comprises three rooms, about 30 feet by 26 feet, and one smaller. The lecture room will be largely used for the study of botany, and is provided with a small conservatory, or window box, in which experiments, such as those showing the process of germination, will be carried out. In the chemistry laboratory benches are provided at which girls will work in sets of two, and each set will have a balance on side benches close at hand. The physics laboratory is on very much the same plan as the chemistry room. Mr. Hobhouse, in the course of his speech, remarked that the education of girls was of the highest importance, not only in order to fit them for their domestic duties, but also to provide good women teachers. Prof. Armstrong hailed the opening of the new science rooms as a proof that science, once almost neglected, was now considered a necessary part of a liberal education.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 26.—"On the Cytology of Apogamy and Apospory. (1) Preliminary Note on Apogamy." By J. B. Farmer, F.R.S., J. E. S. Moore, and Miss L. Digby.

The phenomenon of apogamy is exhibited when the young fern-plant springs directly from the tissue cells of the prothallium generation, instead of arising as the result of segmentation of the egg within the archegonium. It has been regarded as a "short cut" in the life-cycle, and some theoretical importance has been attached to it in connection

change is brought about, in the apogamous development, by the migration of a nucleus to an adjacent cell, and its subsequent fusion with the nucleus of that cell. A considerable number of instances were observed in which single cells contained two nuclei, and when this was the case, one of the contiguous cells was always seen to be destitute of a nucleus. Instances of the transit of the nuclei through the walls were also seen. Further, the nuclei of some of the cells in the region where these occurrences were discoverable could occasionally be met with in stages at which it was found possible to estimate the number of chromosomes. In such cases these were double the number of those of the ordinary prothallial nuclei.

These facts lead to the inference that we are dealing with an irregular kind of fertilisation, or, at any rate, with a mechanism for doubling the nuclear chromosomes that is practically identical with what is seen in normal fertilisation. In the latter case the double number is arrived at by the addition of the chromosomes of the sperm-nucleus to those of the nucleus of the egg.

The annexed figure illustrates (1) two cells in which the nucleus of the one is passing through the parti-wall, and apparently fusing directly with the other nucleus; (2) a cell with two nuclei, one of which has been derived from the cell at the top right-hand corner of the figure.

May 7.—"Preliminary Note on the Discovery of a Pigmy Elephant in the Pleistocene of Cyprus." By Dorothy M. A. Bate. Communicated by Henry Woodward, LL.D., F.R.S., F.G.S., V.P.Z.S., late Keeper of Geology, British Museum, Natural History.

The elephant described was discovered by the author in 1902 during a search for bone-caves in the Kerynia Range in the north of the island. The collection obtained chiefly consists of a series of teeth, all procured from a single deposit, which also contained a very much larger quantity of the remains of *Hippopotamus minutus*.

The teeth of the Cypriot elephant are considerably smaller than those of *Elephas mnaidriensis*, the largest of the Maltese forms, and are also slightly inferior in size to those of *E. melitensis*. As a general feature it may be said that the molars from Cyprus are more simply constructed than those of the last-mentioned species, showing a slighter tendency to "crimping" in the enamel and in being less inclined to develop the mesial expansion of the plates of dentine so characteristic of those of *E. africanus*. Taking into consideration the several characters in which the teeth of the Cyprus form differ from those of all hitherto described dwarf species (putting on one side *E. lamarmorae*, the teeth of which are unknown to science), as well as the distinct habitat of the animal, it is believed to be specifically distinct, and it is therefore proposed to name it *Elephas cypriotes*. The discovery of this pigmy species is interesting in comparison with those from Malta and Sicily, and the occurrence of these different, though apparently closely related, small races of elephants in widely separated islands of the Mediterranean lends probability to the theory that this is a case of independent development along similar lines, the result of similar conditions of existence.

Physical Society, May 8.—Dr. R. T. Glazebrook, F.R.S., president, in the chair.—Mr. T. H. Blakesley exhibited and described a spectroscope of direct vision, of one kind of glass, and of minimum deviation for every ray that comes into the centre of the field of view. The refracting angles are such that the cosines of half the refracting angles are equal to half the index of refraction for the ray which is to have no deviation. The first prism is right-angled, and has one angle equal to the refracting angle calculated by the above rule. The second prism and the third possess the refracting angle so obtained, and the fourth is similar to the first. The plan adopted can be extended by employing more than one of the arrangements described, in sequence.—Prof. J. D. Everett read a paper on the mathematics of bees' cells.—Mr. W. A. Price read a note on the coloured map problem. He referred to the fact that only four colours are required to colour a map on the surface of a simply connected region, such as a sphere, in such a way that two countries marching on a boundary line are coloured differently, and exhibited two models of anchor rings the surfaces of which were divided in each case into six sections, each of which marched with

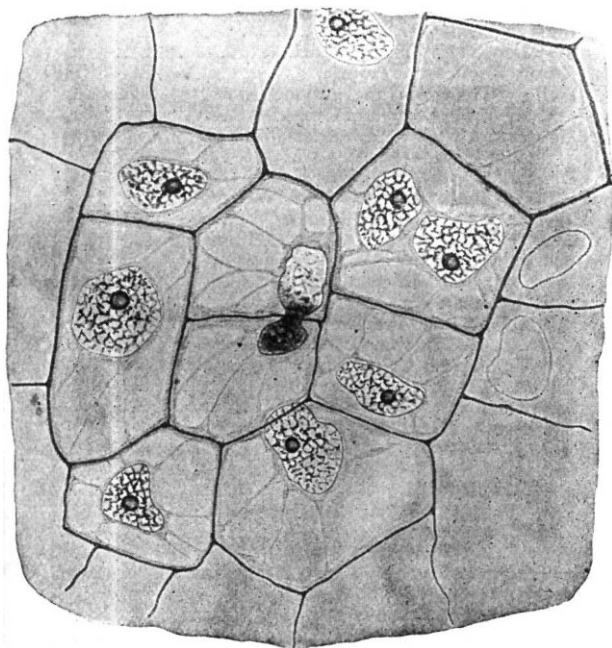


FIG. 1.—Group of prothallial cells with migrating nuclei.

with the relationships believed to exist between the gametophyte and the sporophyte, that is, between the prothallium and the fern-plant. Now it has been known for some years that the nuclei of these two generations exhibit a constant difference *inter se* of such a nature that each sporophyte nucleus contains twice as many chromosomes as do the individual nuclei of the gametophyte.

Evidence is brought forward to show that this nuclear